

**WORK SURFACE DEVICE****CROSS-REFERENCE TO RELATED APPLICATIONS**

Not Applicable

**STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR  
DEVELOPMENT**

Not Applicable

**REFERENCE TO SEQUENCE LISTING, A TABLE OR A COMPUTER PROGRAM  
LISTING COMPACT DISK APPENDIX**

Not Applicable

**BACKGROUND**

**[0001]** The present invention relates generally to a device that provides for a work surface and more particularly to a multipurpose, portable, adjustable, work surface for use on a lap, tabletop, or other support surface.

**[0002]** The background information discussed below is presented to better illustrate the novelty and usefulness of the present invention. This background information is not admitted prior art.

**[0003]** It is frequently the case that when needed, a work surface is not handily available. At other times, although available when needed, the work surface at hand is lacking in one or more required specific attributes. For example, a person wishing to write a letter while seated comfortably in an easy chair would require not only a hard work surface on which to position the writing paper, but, additionally, one that could be securely positioned at an angle comfortable for the user. Likewise, a bed-bound reader in a semi-inclined position would greatly benefit not only from a surface to support the book being read, but from a work surface that would position the book at eyesight-level. Holding a book up to eye level, if the book is heavy, soon becomes an unpleasant chore instead of the pleasing activity it should be, especially if the material being read is an awkwardly oversized book or magazine.

**[0004]** Positioning a stiff board on one's lap is one way to provide a hard supporting work surface on which to write or to hold reading material. Having such a board on one's lap, however, soon becomes uncomfortable as a rectilinear board does not conform to the shape constraints of most laps. Moreover, it would be difficult to

maintain a board one's lap at an angle comfortable for reading or writing. The board could be held at an angle, by placing the board on the user's crossed knees and situating the board so that it was tilted toward the user of the board, but sitting with one's legs crossed for any length of time can be uncomfortable and, in fact, is discouraged for health reasons.

**[0005]** Furthermore, even if the work surface provided by the board could be maintained in an angled position, such as by being supported on a pillow, there would be no means by which the workpiece, such as a piece of writing paper or a book, could be maintained in a particular position, such as one that would accommodate the specific needs of a right-handed or a left-handed person.

**[0006]** In addition to being desired for making reading and writing easier and more comfortable, work surfaces are essential for persons wishing to take notes whether by hand or electronically, such as when attending a lecture. The now nearly ubiquitous use of lap-top computers has created a need for lap-top computer work surfaces. Such a work surface would ideally support the lap-top computer so that the computer's screen is maintained at an angle that reduces eye strain, which is often encountered while working with a lap-top. Moreover, the surface supporting the lap-top should be able to be positioned to reduce wrist strain that often accompanies repetitive motion activities, such as when a lengthy piece of text must be keyed into the computer. Furthermore, the laptop work surface should be portable and also should be comfortable when positioned on a person's lap.

**[0007]** Work surface devices that provide comfortably positioned surfaces are also desired when working on a newspaper offered crossword puzzle, to hold and position printed instructions for easy viewing while one's hands are occupied, such as while cooking, for instance. Well designed work surfaces should also be able to make it easier and more pleasant to work on homework assignments, to embroider, draw, or paint, for instance. Moreover, it is frequently necessary, or desirable, to have a portable, positionable tray or activity surface on hand, particularly when traveling or when confined in bed.

**[0008]** Some attempts to provide a work surface that meets at least some of these needs have been made, however these devices suffer from one or more

deficiencies, such as excessive bulk, being too heavy to carry conveniently, costly to manufacture, provide only one angle of inclination at which a workpiece can be positioned and/or lack directional support for a workpiece, lack compact storage capability and are not readily portable.

**[0009]** Therefore, there is still exists a need for a lightweight, inexpensive portable work surface device that offers working configurations at various inclinations, which will hold a workpiece in a convenient position for both left- and right-handed persons, can be compactly stored, and offers ease of portability.

### SUMMARY

**[0010]** Accordingly, the present invention discloses a novel, portable, multi-functional work surface device that can be used as a lap-desk or can be placed on any type of support surface. The disclosed work surface is designed to be useful in a variety of applications, such as when a person is sitting on a couch, an easy chair, a bed, in a car, an airplane, a train, a bus, on the floor, at a lecture, or outdoors. Additionally, the work surface is useful when placed upon another, essentially horizontal surface, to provide a work surface that is at some convenient height from and at some convenient angle to a horizontal surface.

**[0011]** In particular, the invention is an adjustable reading and writing workpiece support system that permits a user to optimize a writing or reading support surface orientation to reduce muscle strain and tension by allowing the user to maintain a relaxed and balanced posture orientation. Accordingly, the work surface of the work surface device can be easily and securely maintained at plurality of comfortable angles and heights, or alternatively, may be positioned to provide an essentially flat work surface for use as a meal tray, for example.

**[0012]** Furthermore the disclosed invention provides means to securely position a workpiece, such as a writing pad, paper, book, or the like at a plurality of desired angles on the work surface, which, as described above, is also positionable at a plurality of desired angles. Therefore, both a workpiece and the work surface can be simultaneously maintained in a desired, stable position during a reading, writing, or during the performance of some other function.

**[0013]** Additionally, the portable, lightweight, adjustable work surface device of the present invention, provides both a support surface and a workspace for those who use a laptop computer, regardless of where the surface and space is needed. The work surface member of the device is large enough to hold both the keyboard part and the display part of a laptop so the user can move farther away from the monitor, helping to prevent eye fatigue.

**[0014]** The light weight of the device combined with its ergonomic design allows the work surface device to be held comfortably on one's lap for long periods of time, if desired. The ergonomic feature of the device is achieved by providing for its base member to have an arcuate indentation in the edge of the base member intended to be adjacent to the body of the user of the work surface device.

**[0015]** Accordingly, the present invention provides for a work surface device for supporting a workpiece, comprising:

- a. a first member having a first surface and a second surface,
- b. a second member having a first side and a second side, which sides may be construed as a first edge and a second edge, or as a first part and a second part, for example, and
- c. a base member, whereby
- d. the first member is rotably hinged to the first side of the second member, and
- e. the third member is rotably hinged to the second side of the second member, and furthermore, where the
- f. the first member, the second member, and the third member are hingedly adapted to be folded together, moreover
- g. the first member and the second member are positionable at a plurality of angles with each other and with the third member, and additionally
- h. the rotatable hinge joints are adapted to securely position the first member, the second member, and the third member in any one of the plurality of angles, and
- i. the third member is adapted to support the device on a supporting surface.

**[0016]** The work surface device further comprises a support for supporting the workpiece in various positions on the work surface of the first member.

**[0017]** The work surface device moreover comprises one or more receptacles for holding work tools, such as pencils, pens, paint brushes, and the like, and one or more holders for holding a container, such as a cup of coffee, water for use in water color painting, glue, and the like.

**[0018]** The holders for holding a container are detachably attached to the device and may be conveniently stored on the device when the device is not in use or when it is closed for convenient storage or portability.

**[0019]** The base of the work surface device is ergonomically shaped to conform to a shape of a person's lap allowing for the device to be held on one's lap for extended periods of time without the device becoming uncomfortable.

**[0020]** The device may be as lightweight or as heavy as desired, depending on the materials from which the device is manufactured. The device may be molded from a light-weight plastic or made from wood, metal, fiberglass or other material that will suit a user's needs.

**[0021]** The work surface device is functionally adapted to be securely positioned at a desired height and at plurality of angles with each other by a variety of securing means.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0022]** In order that these and other objects, features, and advantages of the present invention may be more fully comprehended and appreciated, the invention will now be described, by way of example, with reference to specific embodiments thereof which are illustrated in appended drawings wherein like reference characters indicate like parts throughout the several figures. It should be understood that these drawings depict only two preferred embodiments of the present invention and are not therefore to be considered limiting in scope. The invention will now be described and explained with added specificity and detail through the use of the accompanying drawings, in which:

**FIG. 1** is a perspective backside view of a preferred embodiment of the work surface device according to the principles of the present invention.

**FIG. 2** is a side plan view of the work surface device in an open and relatively upright position, similar to that shown in **FIG. 1**.

**FIG. 3** is a side plan view of the work surface device, as shown in **FIG. 2**, illustrating the lap-desk in a closed position.

**FIG. 4** is a front plan view of the work surface device illustrating the workpiece support in three positions: for use by a right-handed person, a left-handed person, and for horizontal support of a book or the like.

**FIG. 5** is a perspective top view of another preferred embodiment of the work surface device according to the principles of the present invention.

**FIG. 6** is a side plan view of the work surface device in an open position, as shown in **FIG. 5**.

**FIG. 7** is a side plan view of the work surface device, as shown in **FIG. 6**, illustrating the lap-desk in a closed position.

#### Definitions

“Container” as used herein may refer to containers to hold tools, such as pens, pencils, or brushes, containers for holding water for use with water colors, or cups for a beverage, for example.

“Hinged” as used herein means to have attached by the use of hinges or to have furnished with hinges.

“Work tool” as used herein includes fountain pens, ball point pens, mechanical or non-mechanical pencils, markers, paint brushes, cutting tools, or stylii that are used to make a mark in form of an impression on contact, for example.

**A list of aspects of the embodiment of the invention described to which the following reference numbers refer.**

- 10** A preferred embodiment of the work surface device of the present invention.
- 12** First member of **10** serving as a working surface.
- 12a** First side of first member **12**.
- 12b** Second side of first member **12**.
- 14** Second member of **10** serving as an elevator support.

- 14b** A surface of second member **14**.
- 16** Third member of **10** serving as a base for the work surface device.
- 16b** A surface of third member **16**.
- 18** A support means for a workpiece, such as a book, computer, crossword puzzle, painting, and the like.
- 18a** Support means **18** positioned for use by a right-handed person.
- 18b** Support means **18** positioned for use by a left-handed person.
- 18d** Alignment pins that are inserted into positioning holes **28** for securing support means **18**.
- 20** Wire fulcrums for angular positioning of **14**.
- 22** Differential wire support for angular positioning of **12**.
- 28** Position holes for positioning support **18**.
- 30a** First holder means for holding a container, such as a cup or the like.
- 30b** Second holder means for holding a cup or the like.
- 30c** Third holder means for holding a cup or the like.
- 32** Storage space for holders **30a**, **30b**, or **30c**.
- 34a** First support for holders **30a**, **30b**, or **30c**.
- 34b** Second support for holders **30a**, **30b**, or **30c**.
- 40a** First suspension grommet holder for holding a pen, pencil, paint brush, or the like.
- 40b** Second suspension grommet holder for holding a pen, pencil, paint brush, or the like.
- 42a** First rotatable friction hinge.
- 42b** Second rotatable friction hinge.
- 42c** Third rotatable friction hinge.
- 42d** Fourth rotatable friction hinge.
- 44** Ergonomically shaped curved indentation in base member **16** to provide a comfortable and sturdy fit when indentation is placed adjacent to the user of the work surface device.
- 50** Another preferred embodiment of the work surface device as described herein.
- 60a** Support grooves for positioning differential wire support **22**.
- 60b** Support grooves for positioning differential wire support **22**.
- 60c** Support grooves for positioning differential wire fulcrum **20**.
- 60d** Support grooves for positioning differential wire fulcrum **20**.
- 62a** First rotatable hinge.
- 62b** Second rotatable hinge.
- 62c** Third rotatable hinge.
- 62d** Fourth rotatable hinge.

**[0023]** It should be understood that the drawings are not necessarily to scale, for instance, depending on the desired use, the size of the first, second, and third planar section of the work surface device may vary from small for use by a child to large for use by an adult and still be within the teachings of the invention. Additionally, the pen and cup holders may be of various sizes and shapes depending on how they are to be

used. In certain instances, details which are not necessary for an understanding of the present invention, or which render other details difficult to perceive, may have been omitted.

## DETAILED DESCRIPTION

**[0024]** Referring now, with more particularity, to the drawings, it should be noted that the disclosed invention is disposed to embodiments in various sizes, shapes, and forms. Therefore, the embodiments described herein are provided with the understanding that the present disclosure is intended as illustrative and is not intended to limit the invention to the embodiments described herein.

**[0025]** The present invention is directed towards a light-weight, multipurpose, portable, adjustable, workpiece-positioning work surface device for use on a lap, tabletop, bed, or other support surface, whereby the work surface device provides a surface for painting, drawing, eating, or reading, for example. The work surface device has many functions, such as a lap desk, a work surface for a laptop computer, a bed tray, a book holder, a music stand, and a painting easel. Moreover, the surface is designed to hold a book or other workpiece in a position that is convenient while one is resting comfortably in a recliner. At other times, when one is busy working with one's hands, such as when preparing a recipe, potting a plant, or painting, the device securely positions the recipe or instructions in a position convenient for viewing while working. Additionally, the work surface has means to accommodate left- and right-handed writers, persons with small and large laps, and writers who use a writing instrument such as a pen or pencil or a lap-top computer.

**[0026]** Turning now to the drawings, **FIG. 1**, a perspective back view of an exemplary preferred embodiment, shows work surface device **10**. Work surface device **10**, adapted for supporting a workpiece, comprises first member **12** having first surface **12a** and second surface **12b**, second member **14**, and third member **16**. Member **16** is adapted to function as a base for the device. First member **12** and third member **16** are shown rotably hinged by rotatable friction hinges **42a** and **42c**, and hinges **42b** and **42d**, respectively, to opposing sides of second member **14**. First member **12** and second member **14** may be positioned to any one of a plurality of angles with respect to each

other and with respect to the third member. Furthermore, the connections between the members are functionally adapted to securely hold, for as long as desired, said first member, said second member, and said third member in any one of said plurality of angles. It will be understood that the three members of device **10** may be rotably connected using other now known or yet to be known connecting techniques, to provide an example of such a connection, a description of a variation of a rotatable connection is provided below. As illustrated, first member **12**, second member **14**, and base member **16** are rotably, hingedly connected so as to be easily and rapidly folded together in a compact manner for convenient storage and portability.

**[0027]** Second member **14** between first member **12** and third member **16** functions as an elevator support providing the means to elevate and lower first member **12** relative to base member **16**.

**[0028]** Work surface device **10** is provided with first suspension grommet holder **40a** for holding a pen, pencil, paint brush, or the like and, if desired, device **10** may also be provided with a second suspension grommet holder **40b** also for holding a pen, pencil, paint brush, or the like. The number of grommet holders may be increased as required, if for instance, a drafting artist needed to have several differently sized drafting pens readily available.

**[0029]** First holder **30a**, for holding a container, such as a cup, a vessel for holding pens, pencils, brushes, or the like, is shown positioned in holding part **34a**. Second holding part **34b**, as illustrated in **FIG. 1**, may be provided as desired for extra container holding capacity. When work surface device **10** is to be folded for storage or for transport, holder parts, such as **30b** and **30c**, may be stored in storing holder part **32**. Holder parts, such as **30a**, **30b**, and **30c** may be provided in different sizes to accommodate differently-sized containers, and, of course, may be used to hold any desired object besides a container.

**[0030]** One side of base member **16** is ergonomically shaped to conform to the shape of a person's lap. Curved indentation **44** provides for a comfortable and sturdy fit when indentation **44** is placed adjacent to the user of work surface device **10** when the device is used as a lap desk.

**[0031]** FIG. 2, a side plan view, shows workpiece support member **12** securely and firmly positioned in a close-to vertical orientation relative to base member **16**, which is shown in a horizontal orientation as it is likely to sit on a horizontally oriented support surface. Member **12** is held securely in the nearly vertical position by the tightened wing nuts that are positioned in friction hinges **42a** and **42c**. The height of workpiece support member **12** relative to base member **16** is determined by the angle at which elevator support member **14** is set. Elevator support member **14** is held securely in its angled position by the tightened wing nuts that are positioned in friction hinges **42b** and **42d**. FIG. 2 also illustrates how a work instrument, such as the pencil shown in the figure, is supported ready for use by suspension grommet holder **40a**.

**[0032]** FIG. 3, a side plan view of the device, shows how the three members of work surface device **10** fold relative to one another to provide for the device to be compactly closed for storage or transport.

**[0033]** FIG. 4, a front plan view of the device, illustrates workpiece support **18** in three of many possible positions. Shown is support **18** positioned to hold a workpiece in a horizontal alignment, angled for the convenience of a right-handed person, and angled for the convenience of a left-handed person. Support **18** is securely positioned as desired by the use of alignment pins that are affixed to support **18**. Support **18** is securely positioned by placing the alignment pins, such as alignment pin **18d**, into desired positioning holes **28**.

**[0034]** FIG. 5, a perspective backside view of another exemplary preferred embodiment, illustrates work surface device **50** adapted for supporting a workpiece. Work surface device **50** is the same as work surface device **10** in all respects except that the means for securing members **12**, **14**, and **16** in various angles relative to each other comprises a system consisting of wire supports and support grooves in which the wires are placed. Wire support **22** and support grooves **60a** and **60b** are functionally adapted to securely support member **12** when it is positioned at one of a plurality of possible angles relative to members **14** and **16**. Wire fulcrum support **20** and support grooves **60c** and **60d** are functionally adapted for to provide support directly to member **14** and indirectly to member **12**.

**[0035]** Work surface device **50** like work surface device **10** comprises first member **12** having first surface **12a** and second surface **12b**, second member **14** having second surface **14b**, and third member **16** having surface **16b**. Member **16** functions as a base for the device. First member **12** and third member **16** are shown rotably hinged by rotatable hinges **62a** and **62b**, and hinges **62c** and **62d**, respectively, to opposing sides of second member **14**. As discussed above, first member **12** may be securely positioned in any one of a plurality of angles with respect to second member **14** by positioning differential wire support **22** in any one of support grooves **60a** and **60b** affixed to surface **14b** of second member **14**. Second member **14** may be securely positioned in any one of a plurality of angles with respect to third member **16** by positioning differential wire fulcrum support **20** in one of the plurality of support grooves **60c** and **60d** affixed to surface **16b** of third member **16**.

**[0036]** Second member **14** between first member **12** and third member **16** functions as an elevator support providing the means to elevate and lower first member **12** relative to base member **16**.

**[0037]** Work surface device **10** is provided with first suspension grommet holder **40a** for holding a pen, pencil, paint brush, or the like and second suspension grommet holder **40b** also for holding a pen, pencil, paint brush, or the like. And, as mentioned above, the number of grommets may be increased to meet the needs of the user.

**[0038]** First holder **30a** for holding a container, such as a cup, or the like, is shown positioned in holding part **34a**. Second holding part **34b**, as illustrated in **FIG. 1**, may be provided as desired for extra container holding capacity. When work surface device **10** is to be folded for storage or for transport, holder parts, such as **30b** and **30c**, may be stored in storing holder part **32** as illustrated in the example. Container holding parts, such as **30a**, **30b**, and **30c** may be provided in different sizes to accommodate differently-sized containers, and, of course, may be used to hold any desired object besides a container.

**[0039]** Base member **16** is ergonomically shaped to conform to the shape of a person's lap. Curved indentation **44** provides for a comfortable and sturdy fit when indentation **44** is placed adjacent to the user of work surface device **10** when it is used as a lap-desk or as a work surface.

**[0040]** FIG. 6, a side plan view, shows workpiece support member **12** securely and firmly positioned in a nearly vertical orientation relative to base member **16**, which is shown in a horizontal orientation. Member **12** is held securely in the nearly vertical position by positioning the support wires in the support grooves, as discussed above, while its height above member **16** is determined by the angle at which elevator support member **14** is set. FIG. 6 also illustrates how a work instrument, such as the pencil shown in the figure, is supported ready for use by suspension grommet holder **40a**.

**[0041]** FIG. 7, a side plan view of the work surface device of the present invention, shows how the three members of work surface device **10** fold relative to one another to provide for the device to be compactly closed for storage or transport.

**[0042]** Work surface device **10**, adapted for supporting a workpiece, is functionally adapted to be used in a variety of ways. It is contemplated, though, that first surface **12a** of first member **12** most likely will be used to support a workpiece, such as a book or a piece of paper to be used for writing, drawing, painting, or the like, at a height and at an angle that is comfortable, convenient, and at times required by the desired use. It will be understood that the device serves to support any kind of suitable workpiece where the position of the workpiece is important. As was discussed, the workpiece supporting surface **12a** may be raised and lowered relative to the base member of the device and may simultaneously be positioned in a plurality of angled positions to meet the requirements of the user. Third member **16** is used as a sturdy support for the device whether the device is supported by a hard support surface such as a table or work bench, if the device is placed on one's lap, or if the device is used on a bed or chair as a work or eating tray for those who are confined to a bed or chair, for example.

**[0043]** With respect to the device as illustrated in FIG. 1, first member **12** may be securely held in any one of a plurality of angled positions by first loosening the wing nuts functionally related to rotatable, friction, hinges **42a** and **42c**, positioning first member **12** as desired, and then tightening the wing nuts. Once the nuts are hand-tightened the friction hinges are designed to hold the members in any set position.

**[0044]** If a user wishes to elevate workpiece supporting surface **12**, second member **14** located between first member **12** and third member **16**, is set to the angled

position that will achieve the desired height by loosening the winged nuts functionally related to the friction hinged bolts **42b** and **42d**, angularly positioning member **14** with respect to member **16** to raise or lower member **12** to the desired work height, and then tightening the winged nuts to hold member **14** securely in the desired position.

**[0045]** If the work surface device is used in conjunction with an activity that requires work tools to be readily available within reach, where the work tools are of the like of a pen, pencil, paint brush, knives, chisels, or such, the tools may be handily and temporarily stored in the grommet holders provided for such use, such as suspension grommet holder **40a**.

**[0046]** Although there are many reasons to hold a workpiece in a particular working position, one particularly common reason is to meet the different needs of right-handed and left-handed persons. This is especially true when people are writing while supporting the work surface device on their lap. If, for example, one desires to draft a document while in a semi-reclined position in bed or in a chair, it is considerably more comfortable and convenient for the drafter to be able to orient the workpiece specific to his or her handedness. While using the device of this invention, providing for workpiece orientation is quick and simple. To orient a workpiece, a user simply lifts workpiece support **18** so that its alignment pins **18d** are lifted out of alignment positioning holes **28** and reposition the pins in the alignment holes that will provide for the workpiece to be held in the desired position. Such desired positions, as illustrated for example, in **FIG.4**, might be achieved when support **18a** is in a horizontal position, having support **18a** angled for the convenience of a right-handed person, or having support **18b** angled for the convenience of a left-handed person. The alignment pins maintain support **18** securely in the desired position until they are again removed from positioning holes **28**.

**[0047]** There are many instances when it would be desirable to have a work surface lap-desk available. One example is when one wishes to relax after dinner in an easy chair while working on the crossword puzzle of the day. Using the hard surface provided by the lap-desk of this invention to work on the puzzle ensures that clear marks may be made upon the puzzle without tearing the paper. To use the lap desk, one simply places the work surface device upon one's lap with the ergonomically shaped side of the base position against one's body where the curvature of the base

conforms to the shape of a person's lap. This comfort feature, in conjunction with a user's ability to adjust the height, the angle, and the orientation of the workpiece provides for the utmost in comfort and convenience while using the work surface device as a lap desk.

**[0048]** Another need that has become widespread in today's world of electronics, is the need for a surface on which to use a laptop computer. The work surface device according to the teaching of the present invention may be used as a lap-desk to support a laptop or alternatively, the work surface device may be supported on a table, such as a kitchen table to be used as a laptop desk. Regardless of where the work surface device is positioned for use, its use enables a laptop user to adjust the position of the screen of the laptop for maximum viewing effectiveness and it also enables a user to position the keyboard in an ergonomically correct position for keying. Although a laptop is often used for recreational purposes, it is also widely used for job or school related tasks. These tasks normally require diligence and industry. If the laptop computer is not positioned in a convenient and comfortable position, a user will soon tire and be easily distracted. Using the work surface device of this invention may contribute significantly to the quality of the work product produced.

**[0049]** To fold the work surface device for compact and convenient storage or transport, one need only loosen the wing nuts and fold the three members of work surface device relative to one another as illustrated in **FIG. 3** as first member **12**, second member **14**, and base member **16** are rotably, hingedly connected so as to be easily and rapidly folded together. When work surface device **10** is to be folded for storage or for transport, container holder parts, such as **30b** and **30c**, are removed from holder supports **34a** and **34b** and placed for storage in storing holder part **32**.

**[0050]** Accordingly, it has been shown that the work surface device, as described herein, is easy to use. It is also affordable to make and to purchase. One contemplated means of manufacture is that the device members be mass produced by any molding process, such as a plastic injection molding technique, although the work surface device could just as well be made of wood, metal, or fiberglass and could be offered as a kit or as a finished product. Thus it has been shown that the invention

comprises a lightweight, portable, multiuse and multifunctional work surface device adaptable for a variety of uses in a variety of positions.

**[0051]** The foregoing description, for purposes of explanation, uses specific and defined nomenclature to provide a thorough understanding of the invention. However, it will be apparent to one skilled in the art that the specific details are not required in order to practice the invention. Thus, the foregoing descriptions of specific embodiments are presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed. Those skilled in the art will recognize that many changes may be made to the features such as shape, color, materials of manufacture, other embodiments, and methods of making the embodiments of the invention described herein without departing from the spirit and scope of the invention. Furthermore, the present invention is not limited to the described methods, embodiments, features or combinations of features but includes all the variation, methods, modifications, and combinations of features within the scope of the appended claims. The invention is limited only by the claims.